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ROYAL ASTRONOMICAL SOCIETY.

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G. B. AIRY, Esq., President, in the Chair.

Thomas Barneby, Esq., Worcester;
Thomas Turner Wilkinson, Esq., Burnley, Lancashire; and
Sir William Keith Murray, Bart., Stonehaven,
were balloted for and duly elected Fellows of the Society.

Signor A. de Gasparis was balloted for and duly elected an Associate of the Society.

We announce with great sorrow that our respected and venerable associate, Professor Schumacher, died at Altona on the 28th of December last. The Council would gratefully receive any particulars of his life and valuable publications for the *Annual Report.*

On a Method of regulating the Clock-work for Equatoreals.
By the President.

The President resigned the Chair to the Rev. R. Sheepshanks, and gave orally an account of a communication from himself to the Society, which he had placed in the hands of the Secretary. The subject of this paper is supplementary to that of a paper (presented to the Society several years since and printed in their *Memoirs*), "On the Regulator of the Clock-work for Equatoreals." It was shown in that paper, by mathematical investigation, that when the motion of clock-work is regulated by centrifugal balls, whether those balls be suspended to a vertical axis or to a cross-piece carried by a vertical axis, or whether the axis be or be not loaded with a fly-wheel, the balls may alternately approach to and recede from the vertical position, and the angular motion may therefore be irregular. And it was pointed out as a fact of observation that there is frequently a strong tendency to this irregularity: and this was completely explained by remarking that, if the balls once receive in the slightest degree the elliptic motion which produces these appearances, the friction-resistance by which the clock-work is regulated occurs only when each ball is at the extremity of the major axis of its ellipse, and that the effect of resistance at this place is to diminish, not the major but, the minor axis of the ellipse, and thus to render it more and more strongly elliptical. The

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purpose of the present paper was to point out a practical corrective of this inequality of movement: and the following was laid down as a general theorem, of which, in any special case, it is not difficult to give mathematical proof. If a part of the machinery can be selected, so connected with the revolving parts, that when the balls revolve in a circle, that part will be at rest, and when the balls revolve in an ellipse that part will oscillate; and if the movement of that part be subject to friction; then the oscillation and the ellipticity of movement will infallibly be diminished: and if the friction follow such a law that, as the motion diminishes, the friction becomes less than any assignable quantity, then the ellipticity of movement will be diminished without influencing the rate of the clock. The only kind of friction which appears proper for this purpose is the resistance of a perfect fluid to the motion of a plate through it.

Two instances were then pointed out, in which this principle had been successfully applied, though in different ways. The first is in the clock-work of the Liverpool equatoreal; the expansion of the centrifugal balls causes a slider upon the vertical spindle to rise, and elliptic motion of the balls therefore produces oscillation of the slider; the slider is connected by a lever with a plate of metal moving in a vessel of water; and the resistance of this water to the movement of the plate quickly reduces elliptic to circular movement, and produces no effect whatever on the circular movement. The second is in clock-work now in construction for giving uniform movement to a barrel intended to receive the record of transits in the American manner: in this clock-work, which is constructed on principles explained in a former discourse to the Society, a wheel of the clock-train drives the wheel that revolves with the pendulum by the intermediation of a wheel, which is partially free: elliptic motion of the pendulum therefore produces oscillation of the frame carrying the intermediate wheel. This frame is connected with plates moving in vessels of water; and here also the resistance very rapidly reduces the elliptical to circular motion. The President concluded by saying that he considered the practical problem of producing smooth and uniform motion to be now completely solved.

Observations of the Planet Saturn, accompanied by his eight Satellites, Nov. 21, 1850, at about 9^{m} 20^{h} G.M.T.[*]

By Mr. Lassell.

"The sky cleared at about 8 P.M., and on going into the observatory at 8½ I found the atmosphere very fine. I scrutinised the planet for some time, with various powers, *e.g.* 219, 567, 614.

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[*] It will be seen that the notices respecting *Saturn*, his rings and satellites, do not admit of classification, without altering the *form* of the communications. The division in the *outer* ring was seen by MM. Lassell and Dawes. Mr. Bond discovered the *inner dusky* ring, which was partially seen by Mr. Lassell just before he read of Mr. Bond's discovery.

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